

Science

Assessment Plan
2002

New Assessment Plan Tentative Timeline

(Elementary, Middle, and High School)

Michigan State Board of Education

Superintendent of Public Instruction

**Michigan Educational Assessment Program
Standards, Assessment and Accreditation**

Technical Advisory Committee

Content

The assessments
will be based on
the State Board
of Education
Content
Standards
Approved July
1995

English/Language
Arts
(reading, writing,
listening)
Mathematics
Science

Plan for Statewide Assessments

Committees of subject
area experts
including
teachers, curriculum
coordinators,
administrators and
others will develop
the plan.

Focus Groups
District Reviews
Field Reviews
Revisions

Present to SBE

Fall 1998

Test Development

RFP/Contract
and Bidding

Identify
Contractor

Exercise
Development

Content Advisory
Committees will
review test questions

Bias Review
Committee will
review test questions

Spring 1999

Item Tryouts

Statewide tryout
of potential test
items

Item revision
based on tryout
results

Fall 2000

Test Pilots

Statewide pilot
of test forms

Final revisions
to test items
based on pilot
results

Winter 2001

First Administration

Winter 2002

2002 Plan: Minutes Required for Testing

	Science	Mathematics	English Language Arts	Social Studies*	Total
11th Grade	100	100	180	100	480
8th Grade	100	100		100	300
7th Grade			180		180
5th Grade	90			100	190
4th Grade		90	180		270

*** Begins in 1999; no changes in 2002.**

Assessment Plan: Science

I. Assessment Plan Description

A. Structure of the Assessment Plan

This document consists of a plan for assessment of Science. Each subject matter area has a different plan although their structure is similar and planned development schedules are identical. Each subject area plan was developed by a subject area specific committee, but each committee used the same approach to determine its assessment plan.

The plans reflect the translation of content standards into assessment specifications through examination of the assessable content in light of sound measurement principles. The central part of each plan is the specification of the form of the assessment. The plan will also include some item prototypes, reaction from the field to the specifications, schedule for implementation, and a process for accomplishing the development of the assessment.

The list below indicates the major components of the Science Assessment Plan. A brief description of each component is also included. Each component represents an important aspect of the assessment. Together the components serve to define the form and nature of the assessment.

Assessable Content

The assessable content forms the basis for the assessment. This content universe defines what domain is to be assessed. The validity of the assessment is defined by this content. Curriculum frameworks define the content that is included in instruction. The assessable content is more specific and defines that part of the content that will be included on the assessment.

Assessment Specifications

The assessment plan contains specifications for the structure of the assessment. These include a description of how long the assessment is, how many test items and exercises are given, and what those items and exercises look like. The assessment specifications also include the test blueprint, which indicates the emphasis of assessment item type and the content which is assessed by each item type.

Item Prototypes

Example items or prototypes are included in the assessment plan. These can be used as examples of actual assessment items to illustrate what the assessment will look like. These are especially useful for review purposes in the schools and for the public. These item prototypes will not be totally representative of the assessable content, but will attempt to present a breadth of assessment types for examination.

Content and Specification Analysis Survey

A survey of the educational community will be included. The survey will solicit the reaction of educators to the assessable content, assessment specifications, and item prototypes. This feedback will be used to refine the assessment plan document. The survey can be used to inform the schools as well as collect information from educators.

Development Process

The assessment plan contains a plan for development of the assessment. This will include the steps necessary to build the assessment and a schedule for implementation. The description of the development process helps to illustrate the processes put into place to guarantee the validity, reliability, and utility of the assessment. It also informs the school user and public of the procedures used to develop a fair and useful assessment program.

B. Process for Development of the Science Assessment Plan

The translation of content standards into assessment specifications is the responsibility of the content committee. Their work was guided by assessment experts. It was important that the instructional aspects of these assessments be taken into consideration early in the process. The committee was also extremely helpful in determining the information that is to be produced by the assessment.

The assessment plan committee consisted of educators, content experts, and members of the public. The twenty or so individuals were selected because of their knowledge of the subject matter and experience in education in the content area. Committee members were asked to review the curriculum frameworks in order to determine the assessable content. They were also asked to determine assessment blueprints and specifications. Committee members worked on the development of item prototypes.

The committee met five times to determine the major parts of the assessment plan. A list of the committee meetings and the major tasks is listed below.

Meeting 1 Review of the Content and Introduction to Task
1 Day

Meeting 2 Definition of Assessable Content
1 Day

Meeting 3 Score Type and Report Definitions
2 Days

Meeting 4 Review of Assessment Specifications
1 Day

Meeting 5 Development of Item Prototypes
1 Day

C. Purposes of the Assessment Plan

The assessment plan serves the four purposes listed below. The document is useful for informing the education community of the assessment characteristics early in the process. It is also very useful in communicating specifically to potential contractors the scope of work in the development process. The process of developing the plan will allow that major stakeholders in assessment and instruction agree on the nature and feasibility of the assessment before the development process begins.

Alignment of Instructional and Assessment Purposes

The assessment plan allows early in the process for the examination of the alignment of instruction to assessment. Too often assessment is created that does not emphasize the important parts of the instructional sequence. This document serves to illustrate how the curriculum frameworks are related to the assessable content and assessment specifications.

Review Document for Planning and Approval

This document serves as a complete description of the assessment. Often many decisions are made about assessments without a complete picture of the final assessment process and how the assessment fits with the instructional goals. The assessment plan can be used as documentation for the complete assessment as well as a approval and review document.

Documentation for the Public and Schools

Once the assessment plan has been approved and review is completed it can serve as the basis for a document to inform the schools and public about the upcoming assessment program. The assessment plan essentially becomes a guidebook to the assessment. As assessments become more important to the schools, clear communication of their nature, format, characteristics, and purpose becomes very important.

Task Description for the Request for Proposal

The assessment plan will serve as an excellent document to inform potential contractors of the nature and form of the new assessment program. The description of the assessable content, assessment specifications, and item prototypes will allow bidders to respond to concrete information about the assessment. This information should insure a more efficient bidding process and better pricing.

Assessable Content

The assessable content was derived from the Michigan Curriculum Framework and is based on that document. All content that is defined as assessable can be found in the Michigan Curriculum Framework. The assessable content at each grade is a subset of that curriculum framework.

The content defined as assessable is the basis for determining what the scores on any achievement assessment mean. The definition of this content determines the assessment's validity. When scores from this assessment are used they will derive their meaning from the assessable content. This is the definition of what this test measures.

The Science Assessment Plan Committee did a complete review of the curriculum framework and identified the content to be included in the assessable content. The definition of assessable content follows the same structure as the curriculum framework and differs only slightly in scope. The committee did identify areas within the Michigan Curriculum Framework that would not be assessed in the census assessment. These are noted in the Assessable Content that follows.

Content that was not included in the assessable content was identified for two basic reasons. Either the content was beyond the level to be assessed or the content could not be optimally assessed by a paper and pencil assessment instrument in the time frame possible for state testing. The committee made an effort to include as much of the Michigan Curriculum Framework content as could be accommodated.

Science Assessment Specifications

A. General Characteristics

Science will be assessed at the Elementary, Middle, and High school levels. Multiple-choice and constructed-response items will be used to assess the content. Science is organized by content strand in the curriculum framework and the test blueprint is organized along those content classifications. Within strand classifications the content is organized by standard and then for each standard there are a set of benchmarks. Almost all standards will be assessed on each assessment. Although items will be written for a benchmark, the narrative sections of the Michigan Essential Goals and Objectives for Science Education (MEGOSE) will continue to be used as a reference.

Assessment time will be limited to 90-100 minutes of actual testing time, depending on school level.

B. Assessment Blueprint

Elementary School Level-Content Emphasis

STRAND	Percent*
Constructing New Knowledge	30
Reflecting on Scientific Knowledge	10
Using Life Science Knowledge	20
Using Physical Science Knowledge	20
Using Earth and Space Science Knowledge	20

*Percent is the percentage of total points on the test devoted to each strand.

Elementary School-Item Type Balance

	Items	Points	Percent
Multiple-Choice 1 point each	37	37	62
Constructed-Response 3-4 points each	7	23	38
Total Assessment	44	60	100

Elementary School-Question Type Balance

Cluster Problems	Multiple-Choice	Constructed Response/Points
Life Science	3	1/3
Physical Science	3	1/3
Earth and Space Science	3	1/3
Integrated*	3	1/3
Integrated	3	1/3
Investigation	3	1/4
Text Criticism	3	1/4
Individual Questions		
Individual Multiple-Choice	16	
Total	37	7/23

*Note: There will be two Integrated clusters on the test.

Middle School Level-Content Emphasis

STRAND	Percent*
Constructing New Knowledge	25
Reflecting on Scientific Knowledge	15
Using Life Science Knowledge	20
Using Physical Science Knowledge	20
Using Earth and Space Science Knowledge	20

*Percent is the percentage of total points on the test devoted to each strand.

Middle School-Item Type Balance

	Items	Points	Percent
Multiple-Choice 1 point each	43	43	57
Constructed-Response 3-4 points each	10	32	43
Total Assessment	53	75	100

Middle School-Question Type Balance

Cluster Problems	Multiple-Choice	Constructed-Response/Points
Life Science*	3	1/3
Life Science	3	1/3
Physical Science	3	1/3
Physical Science	3	1/3
Earth and Space Science	3	1/3
Earth and Space Science	3	1/3
Integrated	3	1/3
Integrated	3	1/3
Investigation	3	1/4
Text Criticism	3	1/4
Individual Questions		
Individual Multiple-Choice	13	
Total	43	10/32

*Note: There will be two Life, Physical, Earth and Space, and Integrated clusters on the test.

High School Level-Content Emphasis

STRAND	Percent*
Constructing New Knowledge	20
Reflecting on Scientific Knowledge	20
Using Life Science Knowledge	20
Using Physical Science Knowledge	20
Using Earth and Space Science Knowledge	20

*Percent is the percentage of total points on the test devoted to each strand.

High School-Item Type Balance

	Items	Points	Percent
Multiple-Choice 1 point each	43	43	57
Constructed-Response 3-4 points each	10	32	43
Total Assessment	53	75	100

High School-Question Type Balance

Cluster Problems	Multiple-Choice	Constructed-Response/Points
Life Science*	3	1/3
Life Science	3	1/3
Physical Science	3	1/3
Physical Science	3	1/3
Earth and Space Science	3	1/3
Earth and Space Science	3	1/3
Integrated	3	1/3
Integrated	3	1/3
Investigation	3	1/4
Text Criticism	3	1/4
Individual Questions		
Individual Multiple-Choice	13	
Total	43	10/32

*Note: There will be two Life, Physical, Earth and Space, and Integrated Clusters on the test.

D. Score Reporting

Detailed score reporting specifications will need to be formulated after the assessment is completed, however recommendations for the types of scores needed can be made based on the assessment blueprint. Reported scores must demonstrate validity and reliability. This constraint restricts the amount of information that can be provided from a relatively short assessment of this nature.

For individuals a total score in Science achievement should be provided. Strand scores can be provided by individual also, except where content coverage is limited. This would be the case where less than ten percent of the points were devoted to a particular strand. Scores at the strand level will not be extremely reliable and will need to be interpreted as comparisons to a standard or a norm group. They also will not be comparable in raw score terms over test administrations.

Schools and districts can receive the same data as for students in the aggregate. Schools and districts also will be able to get data at the standard (when at least 5 points are available for a standard) and item level in the form of item analysis at the elementary and middle school levels. High school item analysis is not available for test security reasons, but standard level scores could be provided for schools and districts.

Item Prototypes

Assessment Plan committees worked to produce item prototypes in order to illustrate the types of assessment exercises that were envisioned. Two types of assessment exercises were proposed for the assessment. Multiple-choice test items would be used in all content areas as well as open-ended exercises. The type of open-ended item varied somewhat by content area.*

Item prototypes were developed to give examples of exercises. The prototypes have been produced across content areas and item types within each subject. The following prototypes are not meant to be representative of the assessment content or the focus on particular content areas. These prototypes should be useful to reviewers of this plan in order to get a sense of the item exercises. These items are in the prototype stage and may change. They also have not undergone a complete development process and have not been subject to actual testing conditions. They are presented as examples of possible assessment exercise types and not as actual test items.

* Although items will be written for a benchmark, the narrative sections of the Michigan Essential Goals and Objectives for Science Education (MEGOSE) will continue to be used as a reference.

C. General Scoring Guide

Science - 2002 Plan

Answer is correct and contains no extraneous or incorrect ideas.	Answer is essentially correct but contains some extraneous and/or incorrect information.	Answer is partially correct but contains significant errors.	Answer is incorrect.
All elements of the questions are all answered.	Most elements of the question are answered.	Only one element of the question is addressed.	Answer does not address elements of the question.
Answer is logical, with no contradictions and elaborates as needed on all relevant concepts/terms using supportive labels, drawings/diagrams as needed.	Answer is logical, no contradictions and elaborates on some concepts/terms. Diagrams may be incomplete or lacking labels.	Answer contains some contradictions and/or states terms without elaboration.	Answer lacks logic.
Answer is adequately supported by evidence/data or appropriately supported by example(s) of concepts described.	Answer partially supported by evidence/data or supported by some appropriate examples of concepts described.	Answer is supported with some inappropriate examples/data/evidence.	Answer is not supported.

School Report - High School

School						District						State					
Exceeded Standards *	Met Standards	At Basic Level	Not Endorsed	Total Students Tested	Mean Scale Score	Exceeded Standards	Met Standards	At Basic Level	Not Endorsed	Total Students Tested	Mean Scale Score	Exceeded Standards	Met Standards	At Basic Level	Not Endorsed	Total Students Tested	Mean Scale Score
10%	12%	60%	18%	120	380	10%	13%	50%	27%	305	390	17%	28%	25%	30%	110,015	370

	Possible Points	Mean Points Earned by Students at or Above Level 3	School		District		State	
	57		Points Earned	% Correct	Points Earned	% Correct	Points Earned	% Correct
Constructing	12	9.2	8	66.7	6	50.0	9	75.0
Reflecting	14	8.0	7	50.0	7	50.0	10	71.4
Life	10	6.6	9	90.0	8	80.0	9	90.0
Physical	10	6.4	7	70.0	7	70.0	6	60.0
Earth/Space	11	9.3	8	72.7	6	54.5	9	81.8
Total Mean Pts		7.9	7.8		6.8		8.6	
Standard 1	5	4.3	4	80.0	3	60.0	3	60.0
Standard 2	5	1.8	2	40.0	3	60.0	3	60.0
Standard 3	5	2.4	3	60.0	4	80.0	5	100.0
Standard 4	4+	3.1	-	-	-	-	3	75.0
Standard 5	Not Tested	-	Not Tested	-	Not Tested	-	Not Tested	-
Standard 6	5	4.5	4	80.0	3	60.0	4	80.0

	Possible Points 57	Mean Points Earned by Students at or Above Level 3	School		District		State	
			Points Earned	% Correct	Points Earned	% Correct	Points Earned	% Correct
Standard 7	5	4.2	5	100.0	4	80.0	4	80.0
Standard 8	Not Tested	-	Not Tested	-	Not Tested	-	Not Tested	-
Standard 9	Not Tested	-	Not Tested	-	Not Tested	-	Not Tested	-
Standard 10	5	4.1	5	100.0	3	60.0	4	80.0
Standard 11	5	1.6	2	40.0	3	60.0	3	60.0
Standard 12	5	2.5	2	40.0	3	60.0	4	80.0
Standard 13	5	4.4	3	60.0	3	60.0	3	60.0
Standard 14	4 ⁺	.9	-	-	-	-	4	100.0
Standard 15	4 ⁺	2.1	-	-	-	-	3	75.0

- * Exceeded Michigan Standards - Need Scale Score of at least *xxx* for Level 1
Met Michigan Standards - Need Scale Score between *xxx* and *xxx* for Level 2
At Basic Level - Need Scale Score between *xxx* and *xxx* for Level 3

- ⁺ Not enough points to report at the school and district levels

District Report - High School

District						State					
Exceeded Standards *	Met Standards	At Basic Level	Not Endorsed	Total Students Tested	Mean Scale Score	Exceeded Standards	Met Standards	At Basic Levels	Not Endorsed	Total Students Tested	Mean Scale Score
10%	13%	50%	27%	305	390	17%	28%	25%	30%	110,015	370

	Possible Points	Mean Points Earned by Students at or Above Level 3	School		District		State	
	57		Points Earned	% Correct	Points Earned	% Correct	Points Earned	% Correct
Constructing	12	9.2			6	50.0	9	75.0
Reflecting	14	8.0			7	50.0	10	71.4
Life	10	6.6			8	80.0	9	90.0
Physical	10	6.4			7	70.0	6	60.0
Earth/Space	11	9.3			6	54.5	9	81.8
Total Mean Pts		7.9			6.8		8.7	
Standard 1	5	4.3			3	60.0	3	60.0
Standard 2	5	1.8			3	60.0	3	60.0
Standard 3	5	2.4			4	80.0	5	100.0
Standard 4	4+	3.1			-	-	3	75.0
Standard 5	Not Tested	-			Not Tested	-	Not Tested	-
Standard 6	5	4.5			3	60.0	5	100.0

	Possible Points 57	Mean Points Earned by Students at or Above Level 3	School		District		State	
			Points Earned	% Correct	Points Earned	% Correct	Points Earned	% Correct
Standard 7	5	4.2			4	80.0	4	80.0
Standard 8	Not Tested	-			Not Tested	-	Not Tested	-
Standard 9	Not Tested	-			Not Tested	-	Not Tested	-
Standard 10	5	4.1			3	60.0	4	80.0
Standard 11	5	1.6			3	60.0	3	60.0
Standard 12	5	2.5			3	60.0	4	80.0
Standard 13	5	4.4			3	60.0	3	60.0
Standard 14	4 ⁺	.9			-	-	4	100.0
Standard 15	4 ⁺	2.1			-	-	3	75.0

* Exceeded Michigan Standards - Need Scale Score of at least xxx for Level 1
Met Michigan Standards - Need Scale Score between xxx and xxx for Level 2
At Basic Level - Need Scale Score between xxx and xxx for Level 3

+ Not enough points to report at the school and district levels

Michigan Department of Education
Michigan Educational Assessment Program

Science Assessment Planning Committee

Ann Aho
Superior Central School District
Superior Central School

Dr. Phillip J. Holden
Consultant

Herman Boatin
Dearborn Public Schools
A.S.C.

Sarah Lindsay
Midland Public Schools
Science Resources Center

Ellen Daniel Jones
Detroit Public Schools
Department of Mathematics and
Science

Parker Pennington, IV
Ann Arbor Public Schools
Pioneer High School

George Granderson
Detroit Public Schools

Dr. Edward Smith
Michigan State University

Diane Garavaglia
Michigan Department of Education
Michigan Educational Assessment
Program

Annis Hapkiewicz
Okemos Public Schools
Okemos High School

Dr. Barbara Berthelsen
Troy Public Schools
Big Beaver Center

Dr. Philip Larsen
Northern Michigan University
Seaborg Center

Marty Couretas
Retired
K-12 Science Consultant

LaMoine Motz
Oakland Schools

Fredericka Frost
Wayne County RESA

Dr. Rochelle Rubin
Waterford Public Schools

Dr. Burton Voss
Retired
University of Michigan

Mozell Lang
Michigan Department of Education
Curriculum Development Program

Murney Bell
Anchor Bay Schools

Louise Kirks
Detroit Public Schools

Terry Clifton
Jackson Public Schools
Jackson High School

Jeanette Magsig
Muskegon Public Schools

Mark Davids
Grosse Pointe Public Schools
Grosse Pointe South High School

Joe Riley
Ann Arbor Public Schools

Judy Ruddock
Flint Community Schools
Northwestern High School

Dr. Theron Blakeslee
Michigan Department of Education
Curriculum Development Program

Dr. Catherine Smith
Michigan Department of Education
Michigan Educational Assessment
Program